

What is claimed is:

1. A fuel cell stack comprising a plurality of fuel cell units each including an anode electrode, and a cathode electrode, and a solid polymer ion exchange membrane interposed between said anode electrode and said cathode electrode, said plurality of fuel cell units being stacked with separators intervening therebetween, wherein each of said fuel cell units has a rectangular shape having a horizontal length longer than a vertical length; and
a fuel gas supply/discharge passage extends through said fuel stack for supplying a fuel gas to said plurality of fuel cell units and an oxygen-containing gas supply/discharge passage extends through said fuel cell stack for supplying an oxygen-containing gas to said plurality of fuel cell units, said fuel gas supply/discharge passage including a fuel cell gas supply port at an upper corner and a fuel gas discharge port at a lower corner formed at diagonally opposite portions in each of said fuel cell units, said oxygen-containing gas supply/discharge passage including an oxygen-containing gas supply port at an upper corner and an oxygen-containing gas discharge port at a lower corner formed at the other diagonally opposite portions in each of said fuel cell units;
a plurality of fuel cell gas flow passages connecting said fuel gas supply port and said fuel gas discharge port, said fuel gas flow passages being serpentine passages each having two turns; and

a plurality of oxygen-containing gas flow passages connecting said oxygen-containing gas supply port and said oxygen-containing gas discharge port, said oxygen-containing gas flow passages being serpentine passages each
5 having two turns.

2. A fuel cell stack according to claim 1, wherein said turns of said serpentine passages are provided at opposite lateral ends of said plurality of fuel cell units.

10

3. A fuel cell stack according to claim 1, wherein said serpentine passages include a plurality of first grooves and a plurality of second grooves, wherein a selected number of said plurality of first grooves merge into a
15 selected number of said plurality of second grooves.

4. A fuel cell stack according to claim 3, wherein a number of said plurality of second grooves is less than a number of said plurality of first grooves.

20

5. A fuel cell stack comprising a plurality of fuel cell units each including an anode electrode, and a cathode electrode, and a solid polymer ion exchange membrane interposed between said anode electrode and said cathode
25 electrode and said cathode electrode, said plurality of fuel cell units being stacked with separators intervening therebetween, wherein

each of said fuel cell units has a rectangular shape having a horizontal length longer than a vertical length;
30 and

a fuel gas supply port and an oxygen-containing gas supply port are formed at upper corners of said fuel cell units, and a fuel gas discharge port and an oxygen-containing gas discharge port are formed at lower corners
5 of said fuel cell units,

a plurality of fuel gas flow passages connecting said fuel gas supply port and said fuel gas discharge port for supplying a fuel gas to said anode electrode, said fuel gas flow passages being serpentine passages each having two
10 turns; and

a plurality of oxygen-containing gas flow passages connecting said oxygen-containing gas supply port and said oxygen-containing gas discharge port for supplying an oxygen-containing gas to said cathode electrode, said
15 oxygen-containing gas flow passages being serpentine passages each having two turns.

6. A fuel cell stack according to claim 5, wherein said turns of said serpentine passages are provided at opposite
20 lateral ends of said plurality of fuel cell units.

7. A fuel cell stack according to claim 5, wherein said serpentine passages include a plurality of first grooves and a plurality of second grooves, wherein a selected
25 number of said plurality of first grooves merge into a selected number of said plurality of second grooves.

8. A fuel cell stack according to claim 7, wherein a number of said plurality of second grooves is less than a
30 number of said plurality of first grooves.

9. A fuel cell stack comprising a plurality of fuel cell units each including an anode electrode, a cathode
5 electrode, and a solid polymer ion exchange membrane interposed between said anode electrode and said cathode electrode, said plurality of fuel cell units being stacked in a horizontal direction with separators disposed therebetween,
10 wherein each of said fuel cell units has a rectangular shape with a horizontal length greater than a vertical length; and
a fuel gas supply/discharge passage and an oxygen-containing gas supply/discharge passage extending through
15 said fuel cell stack for supplying a fuel gas to said plurality of fuel cell units through said fuel gas supply/discharge passage, and supplying an oxygen-containing gas to said plurality of fuel cell units through said oxygen-containing supply/discharge gas passage, said
20 fuel gas supply/discharge passage including a fuel gas supply port formed at an upper corner of said plurality of fuel cell units and a fuel gas discharge port formed at a lower corner of said plurality of fuel cell units, said oxygen-containing gas supply/discharge passage including an
25 oxygen-containing gas supply port formed at an upper corner of said plurality of fuel cell units and an oxygen-containing gas discharge port formed at a lower corner of said fuel cell units.

30 10. The fuel cell stack of claim 9, further comprising

a cooling medium supply/discharge passage for supplying a cooling medium provided at upper and lower portions in said fuel cell stack, said cooling medium supply/discharge passage including a supply port at a lower
5 portion in said fuel cell stack and a discharge port at an upper portion in said fuel cell stack.

11. The fuel cell stack of claim 9, wherein said fuel gas supply port, said fuel gas discharge port, said oxygen-
10 containing gas supply port and said oxygen-containing gas discharge port each have a rectangular shape having a vertical length longer than a horizontal length.

12. The fuel cell stack of claim 9, further comprising a
15 plurality of fuel gas flow passages connecting said fuel gas supply port and said fuel gas discharge port.

13. The fuel cell stack of claim 12, wherein said fuel gas flow passages comprise serpentine passages each having two
20 turns.

14. A fuel cell stack according to claim 13, wherein said serpentine passages include a plurality of first grooves and a plurality of second grooves, wherein a selected
25 number of said plurality of first grooves merge into a selected number of said plurality of second grooves.

15. The fuel cell stack of claim 9, further comprising a plurality of oxygen-containing gas flow passages connecting

said oxygen-containing gas supply port and said oxygen-containing gas discharge port.

16. The fuel cell stack of claim 15, wherein said
5 plurality of oxygen-containing gas flow passages comprise serpentine passages each having two turns.

17. The fuel cell stack of claim 16, wherein said
serpentine passages include a plurality of first grooves
10 and a plurality of second grooves, wherein a selected number of said plurality of first grooves merge into a selected number of said plurality of second grooves.

18. The fuel cell stack of claim 9, wherein said fuel gas
15 supply port and said fuel gas discharge port are formed at diagonally opposite portions in each of said fuel cell units.

19. The fuel cell stack of claim 9, wherein said oxygen-
20 containing gas supply port and said oxygen-containing gas discharge port are formed at diagonally opposite portions in each of said fuel cell units.

20. A fuel cell stack, comprising:
25 a plurality of fuel cell units each including an anode electrode, a cathode electrode, and a solid polymer ion exchange membrane interposed between said anode electrode and said cathode electrode, said plurality of fuel cell units being stacked in a horizontal direction with
30 separators disposed therebetween;

a fuel gas supply/discharge passage extending through the plurality of fuel cell units for supplying a fuel gas to said plurality of fuel cell units through said fuel gas passage;

5 a supply port for the fuel gas supply/discharge passage formed at an upper corner of the plurality of fuel cell units; and

 a discharge port for the fuel gas supply/discharge passage formed at a lower corner of the plurality of fuel
10 cell units.

21. The fuel cell stack of claim 20, wherein the discharge port and the supply port are formed at diagonally opposite portions of said plurality of fuel cell units.

15

22. The fuel cell stack of claim 20, further comprising an oxygen-containing gas supply/discharge passage extending through said plurality of fuel cell units for supplying an oxygen-containing gas to said plurality of fuel cell units
20 through said oxygen-containing gas passage.

23. The fuel cell stack of claim 22, further comprising a supply port for the oxygen-containing gas supply/discharge passage formed in an upper corner of the plurality of fuel
25 cell units.

24. The fuel cell stack of claim 23, further comprising a discharge port for the oxygen-containing gas supply/discharge passage formed in a lower corner of the
30 plurality of fuel cell units.

25. The fuel cell stack of claim 24, wherein the discharge port for the oxygen-containing gas supply/discharge passage and the supply port for the oxygen-containing gas passage
5 are formed at diagonally opposite portions of said plurality of fuel cell units.

26. The fuel cell stack of claim 20, further comprising a plurality of fuel gas flow passages connecting said fuel
10 gas supply port and said fuel gas discharge port, said fuel gas flow passages being serpentine passages having two turns.

27. A fuel cell stack, comprising:
15 a plurality of fuel cell units each including an anode electrode, a cathode electrode, and a solid polymer ion exchange membrane interposed between said anode electrode and said cathode electrode, said plurality of fuel cell units being stacked in a horizontal direction with
20 separators disposed therebetween;

an oxygen-containing gas supply/discharge passage extending through said plurality of fuel cell units for supplying an oxygen-containing gas to said plurality of fuel cell units through said oxygen-containing gas
25 supply/discharge passage;

a supply port for the oxygen-containing gas supply/discharge passage formed at an upper corner of the plurality of fuel cell units; and

a discharge port for the oxygen-containing gas supply/discharge passage formed at a lower corner of the plurality of fuel cell units.

5 28. The fuel cell stack of claim 27, wherein the discharge port and the supply port are formed at diagonally opposite portions of said plurality of fuel cell units.

10 29. The fuel cell stack of claim 27, further comprising fuel gas supply/discharge passage extending through said plurality of fuel cell units for supplying a fuel gas to said plurality of fuel cell units through said fuel gas supply/discharge passage.

15 30. The fuel cell stack of claim 29, further comprising a supply port for the fuel gas supply/discharge passage formed in an upper corner of the plurality of fuel cell units.

20 31. The fuel cell stack of claim 29, further comprising a discharge port for the fuel gas supply/discharge passage formed in a lower corner of the plurality of fuel cell units.

25 32. The fuel cell stack of claim 27, further comprising a plurality of oxygen-containing gas flow passages connecting said supply port and said discharge port, said oxygen-containing gas flow passages being serpentine passages having two turns.

30